OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **ASHUELOT POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a, also a measure of algal abundance, in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show an *improving* in-lake chlorophyll-a trend, meaning concentrations are decreasing. The results for this season, however, show a marked increase in chlorophyll-a concentrations from 1999. The increase in rain seen in the 2000 season likely caused an increase in the amount of nutrients entering the lake. There was a large change in chlorophyll-a concentrations between the beginning and end of June, which would correlate with spring rain. New Hampshire lakes often experience a spring diatom bloom followed by an increase in golden-brown algae after the diatoms decline in June. Algal analyses indicate a dominance of both golden-brown algae and diatoms during this peak in chlorophyll-a. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows an overall *improving* trend in lake transparency. Water clarity this year, however, was the lowest the pond has experienced since 1992. The Secchi disk reading in late June decreased almost 1 meter from the reading at the beginning of the month. This correlates with the increase in chlorophyll-a concentrations seen in the month of June. The overall increase in chlorophyll-a concentrations this season caused a decrease in lake transparency. The 2000 sampling season was considered to be wet and, therefore, average transparency

readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time! These graphs show an *improving* trend for in-lake phosphorus levels, which means levels are decreasing. Phosphorus concentrations were slightly higher for both water layers this season due to the increase in rain, but are still below the NH mean. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- **Please note** on one occasion this summer the epilimnetic, hypolimnetic, and Millen Inlet phosphorus levels were found to be less than 5 µg/L. The NHDES Laboratory Services adopted a new method of analyzing total phosphorus this year and the lowest value that can be recorded is less than 5 µg/L. Since Ashuelot Pond generally has in-lake phosphorus levels between 5 and 10 µg/L this will not affect the average phosphorus concentrations. We would like to remind the association that a reading of 5 µg/L is still considered low for New Hampshire's waters.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were all very low at the sites tested (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current state standards for *E. coli*.

- DES is going to begin a 5-year study of Ashuelot Pond for plant management through drawdown. A drawdown will be conducted in the winters of 2001 and 2002, and the pond will be studied for 2 years following that to determine changes in both plant type and density. Monitoring will begin during the summer of 2001.

- Conductivity values were low throughout the lake and watershed (Table 6), suggesting very low amounts of salts and other ions entering the lake.

NOTES

- Monitor's Note (6/1/00): Much pollen on lake surface.
- Biologist's Note (7/20/00): Weeds identified as Bladderwort, *Zanichellia*, Native Milfoil.
- Monitor's Note (8/23/00): Water has been high all year. Great amount of floating Bladderwort and Native Milfoil on beaches.

USEFUL RESOURCES

Soil Erosion and Sediment Control on Construction Sites, WD-WEB-12, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

A Guide to Developing and Re-Developing Shoreland Property in New Hampshire: A Blueprint to Help You Live By the Water. North Country RC&D, 1994. (603) 536-2146

Lake Eutrophication, WD-BB-3, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

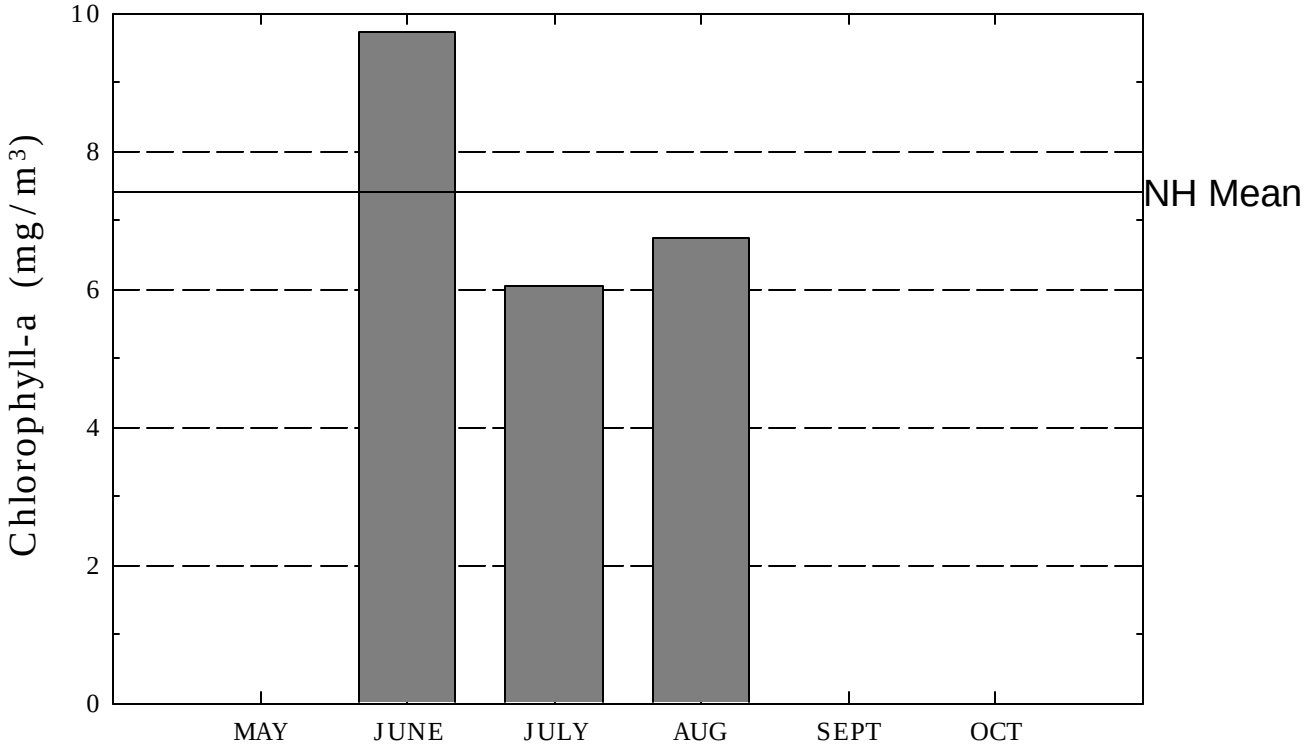
Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Septic Systems and Your Lake's Water Quality, WD-BB-11, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

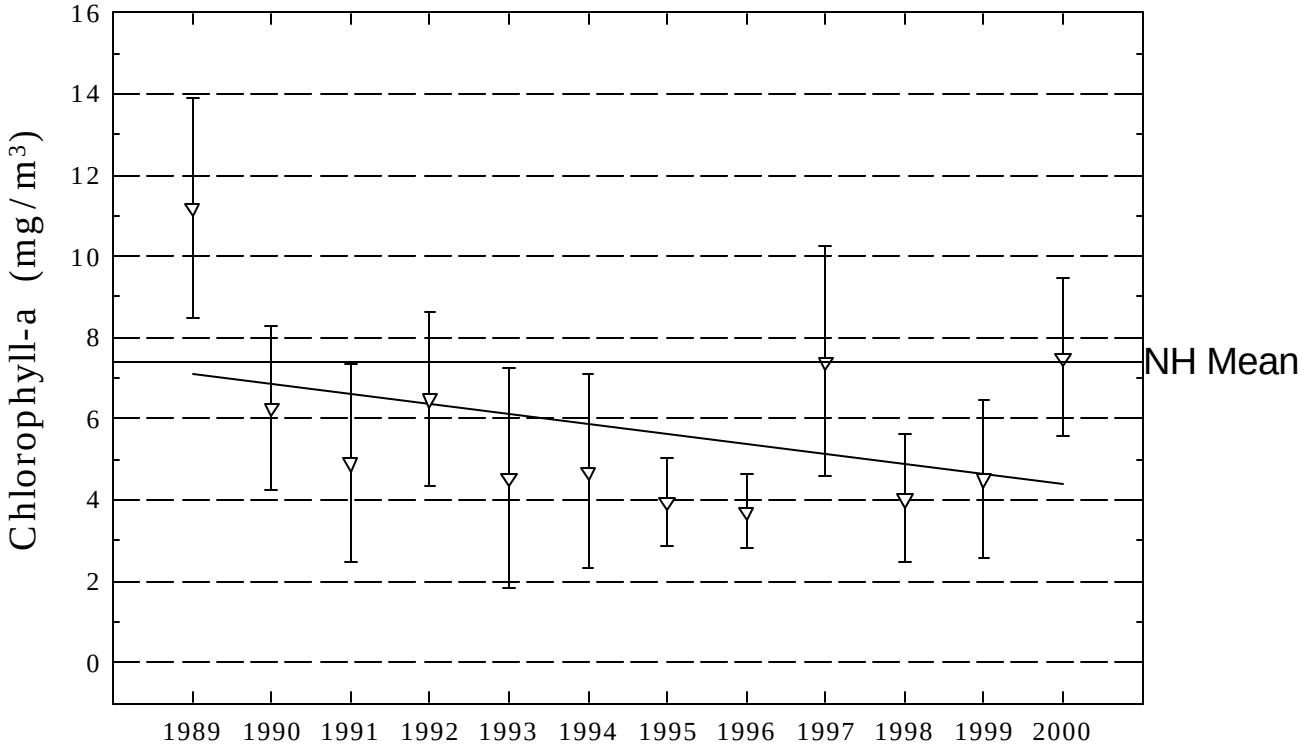
Clean Water in Your Watershed. Terrene Institute, 1993. (703) 661-1582.

Ashuelot Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



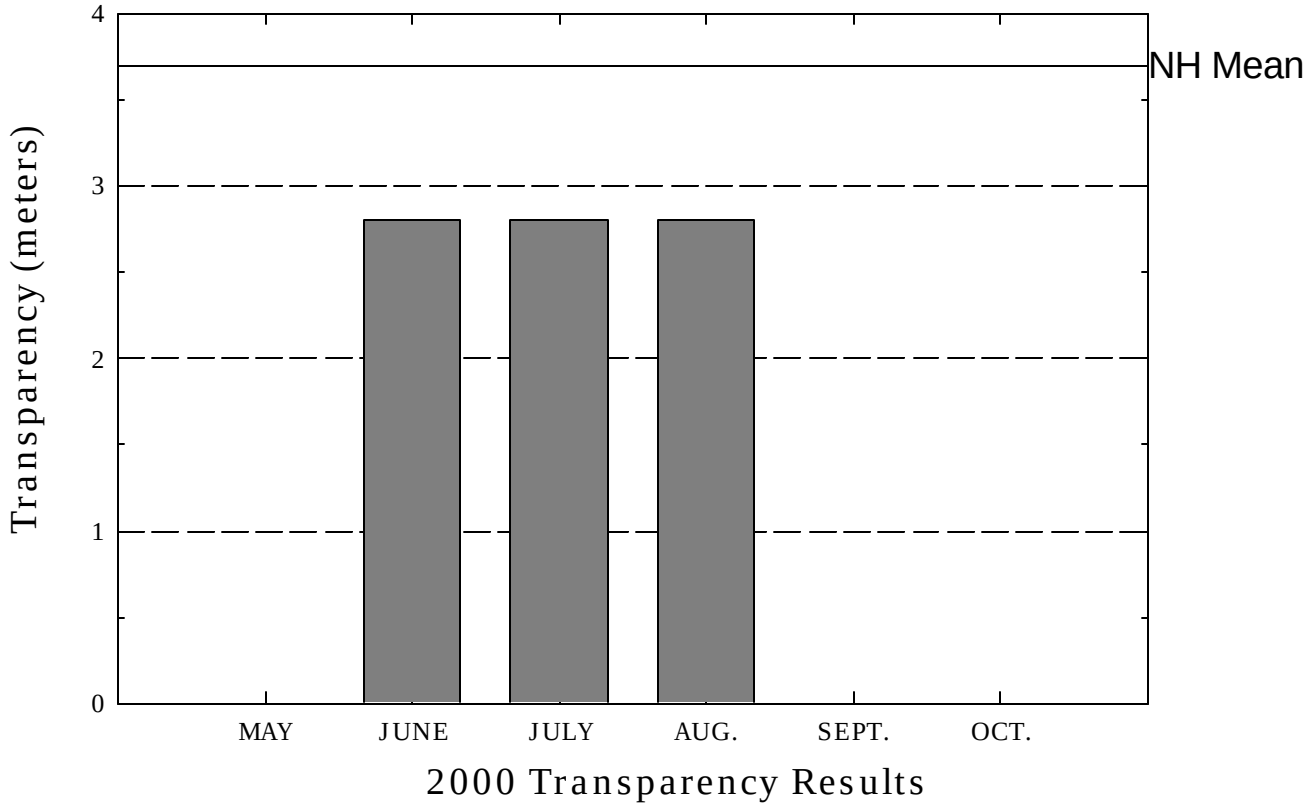
2000 Chlorophyll-a Results

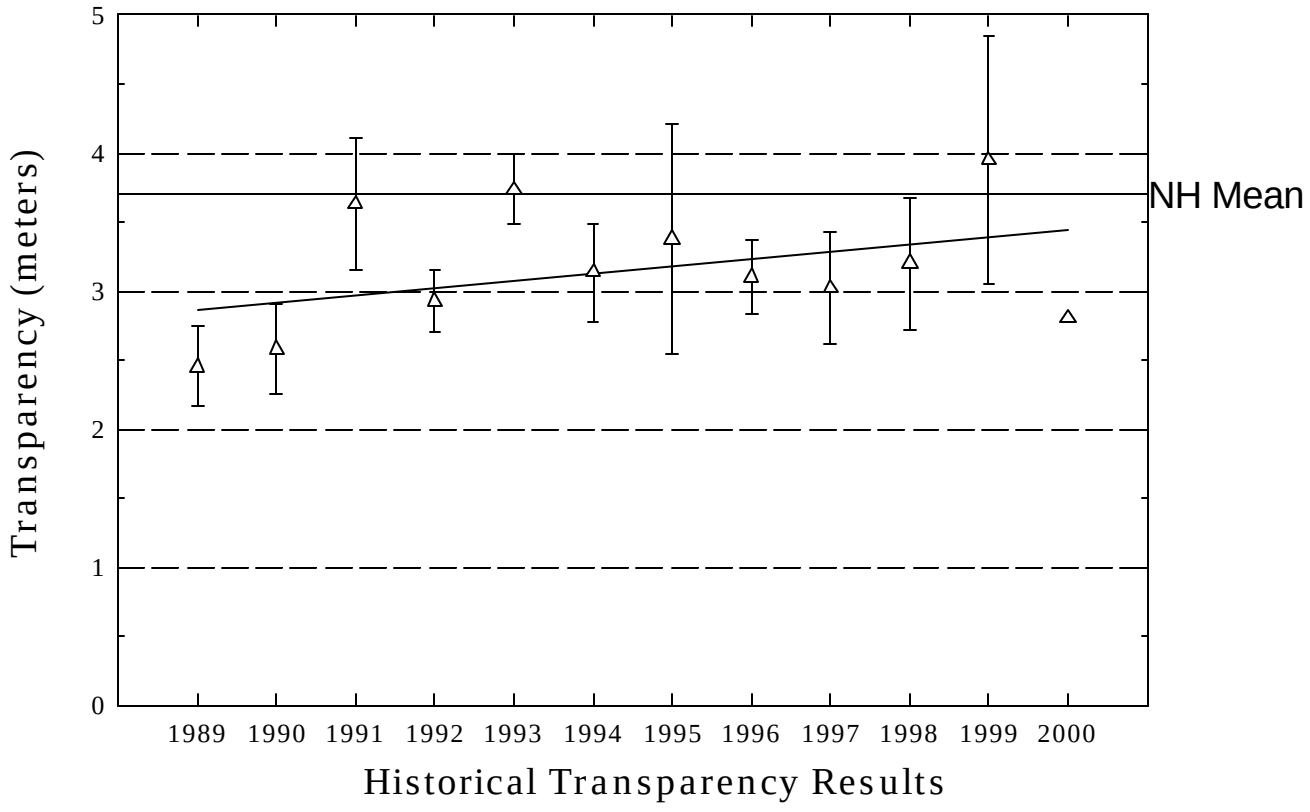


Historical Chlorophyll-a Results

Ashuelot Pond

Figure 2. Monthly and Historical Transparency Results





Ashuelot Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

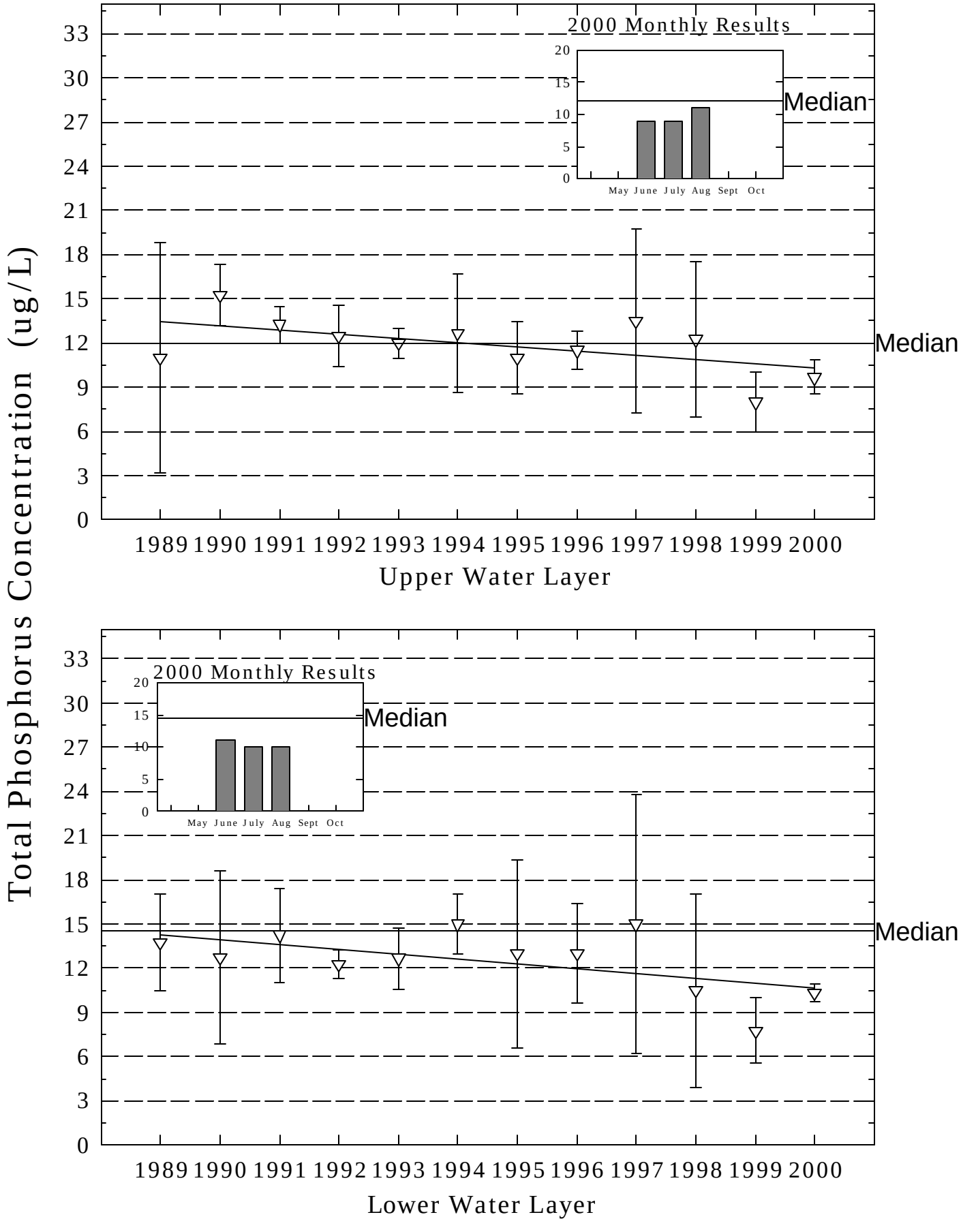


Table 1.

ASHUELOT POND
WASHINGTON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1989	7.30	13.53	11.19
1990	4.60	8.81	6.26
1991	2.13	7.85	4.91
1992	3.71	8.93	6.49
1993	2.73	7.68	4.55
1994	2.18	6.92	4.70
1995	2.33	4.74	3.94
1996	2.39	4.36	3.71
1997	3.27	9.69	7.40
1998	2.21	6.04	4.03
1999	1.83	6.24	4.52
2000	3.67	9.72	6.55

Table 2.

ASHUELOT POND

WASHINGTON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06 / 15 / 1990	ASTERIONELLA	60
	TABELLARIA	23
	DINOBRYON	13
06 / 12 / 1991	ASTERIONELLA	78
08 / 23 / 1991	ASTERIONELLA	39
	CHRYSOSPHAERELLA	22
	TABELLARIA	16
06 / 26 / 1992	ASTERIONELLA	39
	TABELLARIA	32
	RHIZOSOLENIA	16
06 / 18 / 1993	ASTERIONELLA	76
	CHRYSOSPHAERELLA	18
07 / 08 / 1994	ASTERIONELLA	41
	UROGLENOPSIS	39
	DINOBRYON	10
07 / 07 / 1995	ASTERIONELLA	80
	DINOBRYON	8
	RHIZOSOLENIA	6
06 / 20 / 1996	ASTERIONELLA	48
	MALLOMONAS	18
	UROGLENOPSIS	17
07 / 28 / 1997	ASTERIONELLA	98
	SYNURA	1
	SYNDERA	1
05 / 31 / 1998	ASTERIONELLA	62
	UROGLENOPSIS	23
	CYCLOTELLA	6
06 / 28 / 1998	ASTERIONELLA	70
	CHRYSOSPHAERELLA	31

Table 2.

ASHUELOT POND

WASHINGTON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/27/1998	RHIZOSOLENIA	40
	TABELLARIA	38
	ASTERIONELLA	22
08/23/1998	DINOBRYON	51
	TABELLARIA	25
	ASTERIONELLA	18
07/23/1999	ASTERIONELLA	66
	TABELLARIA	20
	DINOBRYON	5
06/01/2000	UROGLENOPSIS	40
	DINOBRYON	35
	ASTERIONELLA	22
07/20/2000	ASTERIONELLA	64
	CHRYSOSPHAERELLA	15
	RHIZOSOLENIA	13

Table 3.

ASHUELOT POND

WASHINGTON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1989	2.1	2.8	2.4
1990	2.2	3.1	2.5
1991	3.0	4.0	3.6
1992	2.6	3.1	2.9
1993	3.5	4.0	3.7
1994	2.8	3.5	3.1
1995	2.3	4.3	3.3
1996	2.9	3.5	3.1
1997	2.7	3.6	3.0
1998	2.5	3.5	3.2
1999	3.4	5.3	3.9
2000	2.8	3.5	2.9

Table 4.

ASHUELOT POND

WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1989	5.24	5.62	5.41
	1990	5.02	5.52	5.29
	1991	5.43	5.62	5.49
	1992	5.44	5.53	5.46
	1993	4.40	5.43	4.80
	1994	5.41	5.75	5.56
	1995	5.60	5.88	5.74
	1996	5.05	6.36	5.35
	1997	5.10	5.74	5.42
	1998	5.13	5.49	5.32
	1999	5.59	5.99	5.81
	2000	5.38	6.20	5.58
HYPOLIMNION				
	1989	5.19	5.64	5.35
	1990	4.91	5.44	5.14
	1991	5.30	5.43	5.37
	1992	5.24	5.51	5.35
	1993	5.33	5.35	5.34
	1994	5.09	5.33	5.23
	1995	5.44	6.13	5.65
	1996	5.00	6.10	5.28
	1997	5.26	5.61	5.39
	1998	5.00	5.44	5.18
	1999	5.26	5.57	5.37

Table 4.

ASHUELOT POND

WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	2000	5.24	5.53	5.41
LAE BEACH				
	1994	5.44	5.44	5.44
MARINA INLET				
	1989	4.74	4.88	4.83
	1990	4.71	5.51	4.86
	1991	4.58	5.35	4.85
	1992	4.90	5.26	5.03
	1993	4.91	5.21	5.04
	1994	4.54	5.18	4.84
	1995	5.11	5.39	5.23
	1996	4.79	5.96	5.15
	1997	5.41	5.56	5.45
	1998	4.93	5.46	5.22
	1999	5.01	5.39	5.21
	2000	5.18	5.52	5.36
METALIMNION				
	1995	5.58	5.58	5.58
MILLEN INLET				
	1989	5.17	5.60	5.35
	1990	4.98	5.45	5.23
	1991	5.12	5.48	5.33
	1992	5.41	5.46	5.43
	1993	4.90	5.46	5.16

Table 4.

ASHUELOT POND

WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1994	5.20	5.46	5.32
	1995	5.46	5.68	5.58
	1996	5.04	6.37	5.25
	1997	5.30	5.55	5.43
	1998	5.06	5.41	5.24
	1999	5.18	5.64	5.40
	2000	5.35	5.54	5.43
OUTLET				
	1989	5.27	5.60	5.45
	1990	5.00	5.50	5.27
	1991	5.34	5.50	5.43
	1992	5.39	5.47	5.44
	1993	5.37	5.45	5.40
	1994	5.18	5.49	5.33
	1995	5.38	5.66	5.54
	1996	5.01	6.54	5.28
	1997	5.29	5.64	5.46
	1998	5.09	5.45	5.28
	1999	5.54	5.68	5.62
	2000	5.24	5.58	5.45
RIVER INLET				
	1989	5.09	5.49	5.21
	1990	5.29	5.61	5.41
	1991	4.85	5.59	5.23
	1992	5.36	5.51	5.46

Table 4.

ASHUELOT POND

WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1993	5.40	5.46	5.43
	1994	4.94	5.40	5.18
	1995	5.46	5.71	5.58
	1996	5.19	6.29	5.42
	1997	5.42	5.61	5.50
	1998	5.06	5.65	5.35
	1999	5.48	5.64	5.56
	2000	5.24	5.64	5.43

Table 5.

ASHUELOT POND

WASHINGTON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1989	0.20	0.60	0.45
1990	0.10	0.20	0.16
1991	0.20	1.20	0.55
1992	0.30	0.80	0.45
1993	-1.20	0.50	-0.23
1994	0.10	0.90	0.47
1995	0.80	1.00	0.85
1996	0.00	1.00	0.53
1997	0.50	1.70	0.85
1998	0.20	0.50	0.30
1999	0.50	0.70	0.60
2000	0.40	0.90	0.58

Table 6.

ASHUELOT POND
WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1989	25.3	28.0	26.5
	1990	23.1	27.3	25.6
	1991	26.8	29.2	27.7
	1992	28.9	31.4	30.8
	1993	28.1	44.6	33.8
	1994	26.8	27.4	27.1
	1995	27.8	31.2	29.8
	1996	24.6	25.3	24.9
	1997	25.5	26.3	25.9
	1998	24.5	27.5	25.3
	1999	27.2	30.0	28.8
	2000	25.8	29.9	28.2
HYPOLIMNION				
	1989	25.0	27.8	26.8
	1990	24.9	28.1	26.6
	1991	26.8	30.1	28.2
	1992	29.1	31.6	30.6
	1993	27.3	30.0	28.6
	1994	27.3	29.0	28.1
	1995	27.8	35.8	31.4
	1996	25.6	26.7	25.9
	1997	25.7	26.3	26.0
	1998	24.3	27.7	26.2

Table 6.

ASHUELOT POND
WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1999	27.2	30.1	28.8
	2000	26.2	29.9	28.5
LAE BEACH				
	1994	27.9	27.9	27.9
MARINA INLET				
	1989	26.3	29.3	28.2
	1990	24.6	31.7	28.0
	1991	23.7	49.2	33.3
	1992	23.6	32.6	28.0
	1993	23.1	43.0	30.5
	1994	22.7	27.1	24.7
	1995	24.9	26.3	25.6
	1996	22.7	26.6	24.2
	1997	26.3	28.9	27.5
	1998	22.3	27.2	24.8
	1999	29.3	33.5	31.3
	2000	27.3	29.2	28.1
METALIMNION				
	1995	29.8	29.8	29.8
MILLEN INLET				
	1989	25.1	27.0	26.3
	1990	22.5	27.3	25.4
	1991	26.8	30.8	28.6
	1992	28.6	30.8	30.1
	1993	26.7	32.3	29.0

Table 6.

ASHUELOT POND
WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1994	27.4	27.6	27.5
	1995	27.6	31.0	29.6
	1996	24.9	26.8	25.6
	1997	25.4	26.4	26.0
	1998	23.7	29.8	26.0
	1999	28.6	31.3	29.9
	2000	26.3	30.3	28.9
OUTLET				
	1989	25.1	27.2	26.3
	1990	23.0	27.4	25.2
	1991	27.6	29.3	28.2
	1992	29.4	32.0	30.8
	1993	26.5	29.9	28.4
	1994	27.1	27.6	27.4
	1995	27.9	31.7	29.8
	1996	24.5	25.1	24.7
	1997	25.7	26.7	26.0
	1998	24.2	27.4	25.2
	1999	28.4	29.6	28.9
	2000	25.1	29.4	27.9
RIVER INLET				
	1989	26.8	33.3	28.8
	1990	21.2	32.2	26.4
	1991	27.9	38.9	32.1
	1992	33.1	38.7	35.3

Table 6.

ASHUELOT POND
WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1993	32.1	38.1	35.0
	1994	26.3	30.3	28.3
	1995	24.2	31.9	28.9
	1996	24.0	26.7	25.1
	1997	23.2	30.8	27.8
	1998	22.9	27.9	24.8
	1999	25.6	29.8	27.6
	2000	24.7	29.6	27.4

Table 8.

ASHUELOT POND

WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1989	1	20	11
	1990	13	18	15
	1991	12	15	13
	1992	10	15	12
	1993	11	13	12
	1994	8	15	12
	1995	8	14	11
	1996	10	13	11
	1997	7	22	13
	1998	9	20	12
	1999	7	11	8
	2000	< 5	11	8
HYPOLIMNION				
	1989	9	16	13
	1990	6	19	12
	1991	12	19	14
	1992	11	13	12
	1993	11	15	12
	1994	13	17	15
	1995	7	22	13
	1996	9	17	13
	1997	6	27	15
	1998	1	16	10
	1999	6	11	7

Table 8.

ASHUELOT POND

WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	2000	< 5	11	9
MARINA INLET				
	1989	1	18	9
	1990	5	55	20
	1991	7	39	21
	1992	3	15	9
	1993	8	28	21
	1994	11	20	16
	1995	8	13	10
	1996	10	13	12
	1997	10	17	14
	1998	1	15	8
	1999	7	12	8
	2000	6	8	7
METALIMNION				
	1995	11	11	11
MILLEN INLET				
	1989	10	16	13
	1990	9	23	16
	1991	11	14	12
	1992	9	13	11
	1993	10	14	11
	1994	9	15	12
	1995	10	14	12
	1996	9	13	11

Table 8.

ASHUELOT POND

WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1997	4	18	12
	1998	1	14	8
	1999	8	9	8
	2000	< 5	10	8
OUTLET				
	1989	8	16	11
	1990	14	16	14
	1991	6	13	9
	1992	10	13	11
	1993	10	11	10
	1994	10	17	13
	1995	6	13	9
	1996	6	21	13
	1997	8	14	11
	1998	7	23	11
	1999	5	10	7
	2000	8	12	10
RIVER INLET				
	1989	5	15	8
	1990	8	17	13
	1991	11	17	13
	1992	13	17	14
	1993	11	18	15
	1994	11	20	16
	1995	10	18	13

Table 8.

ASHUELOT POND

WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1996	7	17	11
	1997	7	19	13
	1998	10	19	14
	1999	6	12	9
	2000	5	19	9

Table 9.

ASHUELOT POND

WASHINGTON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		July 20, 2000	
0.1	20.8	7.6	85.1
1.0	20.6	7.5	83.6
2.0	20.5	7.5	82.8
3.0	20.2	7.4	81.2
4.0	20.1	7.3	80.1
5.0	19.9	7.0	76.9
6.0	17.6	0.9	9.8

Table 10.

ASHUELOT POND

WASHINGTON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 19, 1989	7.0	14.5	7.9	75.0
June 15, 1990	6.0	16.1	6.7	68.2
June 12, 1991	6.5	16.2	2.0	20.4
August 23, 1991	7.5	18.9	6.0	64.9
June 26, 1992	8.0	13.5	0.3	2.9
June 18, 1993	6.0	16.2	6.8	68.0
July 8, 1994	7.0	17.7	0.4	4.0
July 10, 1995	7.0	15.0	0.3	2.0
June 20, 1996	7.5	13.0	2.0	19.0
July 28, 1997	8.0	13.7	0.2	2.0
July 27, 1998	7.0	14.7	0.2	2.0
July 23, 1999	8.0	16.7	0.4	3.7
July 20, 2000	6.0	17.6	0.9	9.8

Table 11.

ASHUELOT POND
WASHINGTON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.8	1.2	1.0
	1998	0.6	1.2	0.8
	1999	0.6	1.0	0.7
	2000	0.6	0.9	0.7
HYPOLIMNION				
	1997	0.7	1.4	1.1
	1998	0.7	2.7	1.3
	1999	0.5	1.7	1.0
	2000	0.8	1.2	1.0
MARINA INLET				
	1997	0.6	1.0	0.8
	1998	0.4	1.0	0.7
	1999	0.4	0.8	0.7
	2000	0.4	0.6	0.5
MILLEN INLET				
	1997	1.0	1.8	1.3
	1998	0.5	1.0	0.8
	1999	0.6	0.8	0.7
	2000	0.5	0.8	0.7
OUTLET				
	1997	0.3	1.0	0.8
	1998	0.6	1.0	0.8
	1999	0.5	0.8	0.7
	2000	0.6	0.8	0.7

Table 11.

ASHUELOT POND

WASHINGTON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
RIVER INLET				
	1997	0.5	0.6	0.6
	1998	0.2	0.9	0.6
	1999	0.4	0.6	0.4
	2000	0.3	0.7	0.5

Table 12.

ASHUELOT POND

WASHINGTON

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
LAE BEACH		
	June 1	0
	June 29	1
	July 20	1
	August 23	0

NOTE: "<" means "less than" and ">" means "greater than"